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BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to consider policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13-10-040, D.14-10-045) and related Action Plan of the California Energy Storage Roadmap.	Rulemaking 15-03-011 (Filed March 26, 2015)

COMMENTS OF THE UTILITY REFORM NETWORK

ON MULTI-USE APPLICATIONS OF ENERGY STORAGE SYSTEMS

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COMMENTS OF THE UTILITY REFORM NETWORK ON MULTI-USE APPLICATIONS OF ENERGY STORAGE SYSTEMS

I. INTRODUCTION

Pursuant to the *Administrative Law Judge's Ruling Noticing Workshop, Jointly Led by the California Independent System Operator and the California Public Utilities Commission and Setting a Comment Schedule* issued April 22, 2016 (*Ruling*), The Utility Reform Network (TURN) respectfully submits these comments regarding the potential Multi-Use Applications (MUA) of energy storage resources. TURN may address additional issues in reply comments.

II. A "STATEMENT OF PRINCIPLES" WILL HELP FOCUS EFFORTS TO ENABLE STORAGE RESOURCES, WHEN APPROPRIATE, TO PROVIDE MULTIPLE SERVICES AND RECEIVE THE COROLLARY REVENUES, WHILE AVOIDING PAYMENTS FOR SERVICES THAT ARE REDUNDANT OR OTHERWISE INAPPROPRIATE

TURN recommends the Commission to adopt a "statement of principles" that can be used to identify those services MUA storage resources[1] should be able to provide and, as a result, be compensated for. This recommendation is an expanded and generalized response to the issues raised by Question 4 of Section 4 of the *Ruling*,[2] which asks several specific questions about the potential for double payment to MUA storage resources.[3]

As an initial matter, the Commission should not conceive the enabling of MUA storage assets to provide multiple services first and foremost as "revenue stacking".

[1] TURN uses the phrase "MUA storage resources" or "MUA storage assets" to denote those storage projects capable of MUAs.

[2] *Ruling*, p. 4.

[3] TURN also provides additional comments in response to Questions 4 and 7 of Section 4 below.

Rather, the consideration of whether MUA storage resources can receive revenues for providing multiple services should start by identifying such possible services and then enabling MUA storage resources to provide such services; these steps will then enable MUA storage resources to earn revenues for providing specific multiple services. A better label than "revenue stacking" would be "service stacking" to indicate that enabling storage assets to provide a service is a pre-requisite to enabling storage assets to earn the related revenues. TURN believes the Commission and California Independent System Operator (CAISO) implicitly recognize that revenues should only be paid for specific services.[4] But TURN believes a more explicit statement of this principle is warranted.

The next foundational principle TURN recommends is that a storage asset, in order to earn revenues,[5] should be providing one or more products that either (a) provide a service pursuant to a market transaction (e.g., sales of energy or ancillary services (AS)) and/or (b) eliminate or defer an expense or capital investment (e.g., distribution asset upgrades) that would otherwise be funded by customers.

Specific rules regarding storage assets' allowable revenue streams will be needed to effectuate this policy. For example, a storage asset should not receive compensation for amorphous "benefits" that do not result in a reduction of customers' net costs. In addition, a storage asset should not receive compensation for services that the asset

[4] For example, at page 3, the *Ruling* states "[t]he workshop also will identify relevant regulatory and market barriers, and possible modifications that would enable a distributed energy storage system to deliver and be compensated for multiple services." The Issue Paper, at page 12, states that its vision for MUA storage resources is "[t]o enable distributed energy storage systems to stack incremental value and revenue streams by delivering multiple services to the wholesale market, distribution grid and end users."

[5] The revenues envisioned in this sentence do not include the fixed payments made to a storage asset pursuant to a utility Power Purchase Agreement, as discussed below.

"could have" provided, but did not provide because some specific service(s) were not selected in a market or other contracting process. Similarly, a storage asset should not receive compensation for a service that it could not provide because it was providing another service that made providing the first service impossible.[6]

Further, thought must be given to various permutations and combinations of storage assets' provision of multiple services. For example, it is likely appropriate for a MUA storage asset to receive two revenue streams for taking a "single action" if that single action provides services in two separate markets. However, it is likely not appropriate for a MUA storage asset to receive multiple revenue streams for taking a "single action" if that action only provides a single service to a single market, even if other consequences of such a "single action" may coincidentally provide some other benefits to the system. Rather, storage assets' compensation must be limited to the specific service or services that they do provide.

To this end, it is important to note that many of the thirteen services identified in the Rocky Mountain Institute study cited at the May 3 workshop – which is excerpted as Attachment A to these comments – cannot be provided *simultaneously*; storage assets should thus not expect to be compensated for all such potential services during the same time interval.[7] In fact, it is possible that providing some benefits in one domain might impose costs in another domain. For example, a customer's effort to manage demand

[6] For example, an asset that is generating energy at full capacity in a time interval will not be able to provide certain ancillary services that require unloaded capacity to be available, such as "contingency (spinning and non-spinning) reserves" or "regulation up."

[7] See *The Economics of Battery Energy Storage, How Multi-Use, Customer-Sited Batteries Deliver the Most Services and Value to Customers and the Grid*, Rocky Mountain Institute, October 2015, available for download at http://www.rmi.org/search-category/Energy+and+Resources/Energy+and+Resources/sharepoint.

charges or time-of-use bills might impose additional costs in wholesale markets for energy and AS. In practice, the *potential* benefits a MUA storage asset can provide may thus not be additive.[8]

Finally, any statement of principles regarding "service stacking" and corollary "revenue stacking" should recognize the role of utility Power Purchase Agreements (PPAs) in providing the fixed revenue streams that enable storage assets to be financed and developed. In exchange for providing storage developers such fixed revenues, each PPA presumably requires the storage asset owner to commit some or all of the asset's potential services to the benefit and control of the purchasing utility.[9] When assessing storage assets' potential services and corollary revenues, such fixed payments should not be considered as a separate and additional source of revenue; rather, fixed payments from PPAs should be recognized as a "swap" by the buyer of one or more potential revenue streams for one fixed revenue stream. Put another way, a PPA may, depending on its particular terms, preclude an owner of a storage asset from directly participating in certain markets in exchange for a fixed payment.

III. COMMENTS[10]

1. Multiple-Use Application (Section 4)

[8] That is, the actual benefits of providing services A and B simultaneously may be less than the sum of benefit A and benefit B when provided separately.

[9] There is no fixed relationship between the amount of such fixed payments and the value of the storage service(s) provided.

[10] TURN is not responding to the "Questions for station power" asked at page 4 of the *Ruling*.

a. 1. What are the distribution system services and revenue opportunities that currently exist for energy storage?

TURN may address this issue in reply comments.

b. 2. What wholesale, distribution and customer services can storage provide now and in the next 2-3 years?

TURN may address this issue in reply comments.

c. 3. To what extent are multiple-use storage applications permitted under current rules? Identify regulatory and market barriers and rules, their limitations and possible modifications that would enable a use case to deliver and be compensated for multiple services.

TURN may address this issue in reply comments.

d. 4. Are there any concerns of overlap between wholesale, distribution and retail services that must be addressed? Which of these services are currently compensated? Does each service provide incremental value? Are there double payment concerns that must be addressed? How should costs and benefits of the same resource serving across the grid be tracked and allocated?

TURN has concerns that there are potential "overlaps" between wholesale, distribution and retail services and that there are thus potential double payment concerns that should be addressed. TURN offered recommendations above about principles to apply to the stacking of MUA storage assets' services to avoid such double payments.

Monitoring the benefits and costs of a storage asset's provision of multiple services may be challenging, particularly when services are provided in multiple domains that have historically been separate. TURN believes the Commission, CAISO, and storage asset buyers and sellers should explore the creation of means to track storage

assets' actual provision of multiple services to help ensure that storage assets are paid for all the services they provide, but no more. However, as TURN suggested in its February 5, 2016, Track 2 Comments, it may be desirable for the Commission, when evaluating utilities' proposed storage contracts, to consider how well such contracts' terms and conditions manage potential double payment concerns. The Commission might even consider prohibiting the utilities from sharing services from a single storage asset with other buyers.[11]

TURN is not commenting herein on how potential services are now compensated and which potential services provide incremental value, but may do so in reply comments.

e. 5. Are there any interconnection concerns that must be addressed?

TURN may address this issue in reply comments.

f. 6. Have metering and sub-metering issues, pertinent to both behind-the-meter and in-front-of-the-meter storage, been addressed in the CAISO's Expanding Metering and Telemetry Options and ESDER initiatives? Are there any metering concerns that must be addressed?

TURN may address this issue in reply comments.

g. 7. Are there any dispatch priority concerns that must be addressed? How should conflicting real-time needs be managed?

As TURN noted in its Track 2 Comments, the CAISO is best positioned to address "conflicting real-time [dispatch] needs," subject to oversight by the Federal

[11] *Opening Comments of The Utility Reform Network on Track 2 Issues*, February 5, 2016, pp. 7-9.

Energy Regulatory Commission (FERC),[12] though the Commission and parties may have specific recommendations the CAISO and FERC should consider. But "dispatch priority concerns" more generally should be considered in addressing potential double payment issues. In particular, such concerns may affect the ability of a MUA storage asset to provide services to multiple markets simultaneously, and thus such an asset's ability to earn revenue streams from such markets for the same time interval. Means for addressing this aspect of this question were discussed in response to Question 4 above.

h. 8. For each regulatory and/or market barrier and/or issue, what is the logical CPUC or CAISO regulatory proceeding to address and resolve the issue?

TURN may address this issue in reply comments.

2. Single-use versus multiple-use applications (Section 2.3)

a. 1. Does the consideration of station power differ depending on whether the storage facility is in a single-use application (i.e., only participating in the wholesale market) or in a multiple-use application (i.e., MUA use cases 1, 3, 4, 5)

TURN may address this issue in reply comments.

b. 2. Is the difference simply a metering consideration?

TURN may address this issue in reply comments.

IV. CONCLUSION

For the foregoing reasons, TURN recommends that the Commission adopt the recommendations set forth herein.

[12] *Id*., pp. 9-10.

Date: May 13, 2016

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ATTACHMENT A

THE ECONOMICS OF BATTERY ENERGY STORAGE

HOW MULTI-USE, CUSTOMER-SITED BATTERIES DELIVER THE MOST SERVICES AND VALUE TO CUSTOMERS AND THE GRID

EXECUTIVE SUMMARY

1820 FOLSOM STREET | BOULDER, CO 80302 | RMI.ORG

PUBLISHED OCTOBER 2015
DOWNLOAD AT: WWW.RMI.ORG/ELECTRICITY_BATTERY_VALUE

EXECUTIVE SUMMARY

UTILITIES, REGULATORS, and private industry have begun exploring how battery-based energy storage can provide value to the U.S. electricity grid at scale. However, exactly where energy storage is deployed on the electricity system can have an immense impact on the value created by the technology. With this report, we explore four key questions:

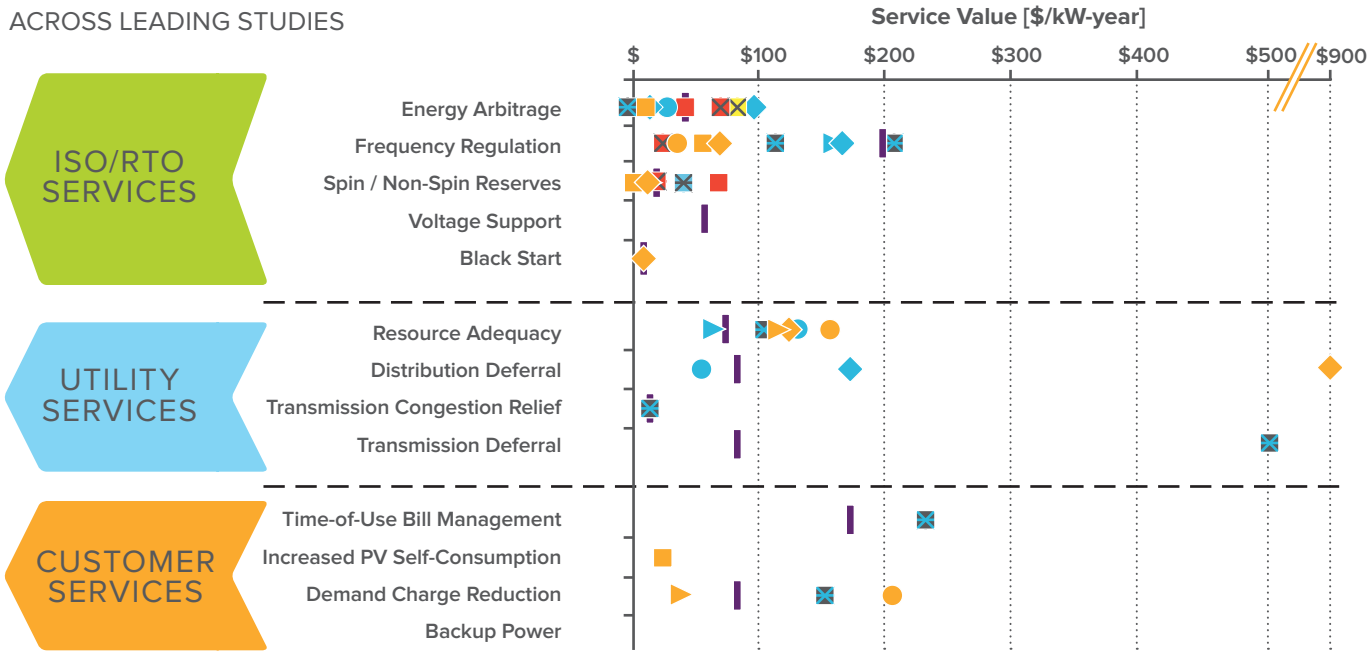
1. What services can batteries provide to the electricity grid?
2. Where on the grid can batteries deliver each service?
3. How much value can batteries generate when they are highly utilized and multiple services are stacked?
4. What barriers—especially regulatory—currently prevent single energy-storage systems or aggregated fleets of systems from providing multiple, stacked services to the electricity grid, and what are the implications for major stakeholder groups?

1. What services can batteries provide to the electricity grid?

Energy storage can provide thirteen fundamental electricity services for three major stakeholder groups when deployed at a customer's premises (behind the meter).

To understand the services batteries can provide to the grid, we performed a meta-study of existing estimates of grid and customer values by reviewing six sources from across academia and industry. Our results illustrate that energy storage is capable of providing a suite of thirteen general services to the electricity system (see Figure ES1). These services and the value they create generally flow to one of three stakeholder groups: customers, utilities, or independent system operators/regional transmission organizations (ISO/RTOs).

FIGURE ES1
ENERGY STORAGE VALUES VARY DRAMATICALLY ACROSS LEADING STUDIES



Results for both energy arbitrage and load following are shown as energy arbitrage. In the one study that considered both, from Sandia National Laboratory, both results are shown and labeled separately. Backup power was not valued in any of the reports.

2. Where on the grid can batteries deliver each service?

The further downstream battery-based energy storage systems are located on the electricity system, the more services they can offer to the system at large.

Energy storage can be sited at three different levels: behind the meter, at the distribution level, or at the transmission level. Energy storage deployed at all levels on the electricity system can add value to the grid. However, customer-sited, behind-the-meter energy storage can technically provide the largest number of services to the electricity grid at large (see Figure ES2)—even if storage deployed behind the meter is not always the least-cost option. Furthermore, customer-sited storage is optimally located to provide perhaps the most important energy storage service of all: backup power. Accordingly, regulators, utilities, and developers should look as far downstream in the electricity system as possible when examining the economics of energy storage and analyze how those economics change depending on where energy storage is deployed on the grid.

FIGURE ES2
BATTERIES CAN PROVIDE UP TO 13 SERVICES TO THREE STAKEHOLDER GROUPS